Operational Summary for Vegetation Management

Fireweed Complex

Fireweed Complex

This operational summary provides information about vegetation management in the fireweed complex. The complex is dominated by fireweed in relatively pure stands. Other species that may occur in small portions within this complex on backlog sites include: thimbleberry (*Rubus parviflorus*), red raspberry (*Rubus idaeus*), grasses, Sitka alder (*Alnus viridus*) and willow (*Salix* spp.).

Topics covered in this summary include development of the complex and its interaction with crop trees; non-timber values and pre-harvest considerations; and management strategies for current and backlog sites.

Other Titles in this Series

Operational Summary for Vegetation Management:

- Dry Alder Complex
- Ericaceous Shrub Complex
- Mixed-shrub Complex
- Pinegrass Complex
- Wet Alder Complex
- Willow Complex

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Table of Contents

Foreword 3
Introduction 3
1. Description 3
2. Development 4
3. Non-timber Values 6
4. Pre-harvest Considerations 6
5. Vegetation Management Strategies for Current Sites 7
6. Vegetation Management Strategies for Backlog Sites 10
7. Summary of Treatment Efficacy 10
For More Information 11
Acknowledgements 11
Appendix –
Key to Biogeoclimatic Zones of British Columbia 11

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Operational Summary for Vegetation Management

Fireweed Complex

Foreword

Managing competing vegetation during reforestation can be challenging. Combinations of plants that thrive in seral ecosystems are often well suited to dominating sites following harvesting or wildfire. While many treatment methods for limiting the growth and spread of these vegetation complexes have been explored, efficacy has varied widely. This is due in part to the widely varying mix of parameters from site to site, including the number, health and structure of the competing plants on site, site conditions and timing of forestry activities. In addition, while some treatments may provide suitable control, the cost in terms of site degradation, hazard to surrounding habitat or crop trees, or the cost of the treatment itself may be prohibitive.

Much work has been undertaken during the past decade by ecologists, silviculturists, and vegetation management specialists on identifying the characteristics of and the range of treatment options for major competing vegetation complexes. Until recently, however, knowledge about managing particularly challenging vegetation complexes was scattered. This series summarizes the key information needed to identify and manage important vegetation complexes in British Columbia.

Introduction

This operational summary provides information about vegetation management issues in the fireweed complex. Topics include: complex development and interaction with crop trees; treatments that affect development of the complex; non-timber and pre-harvest considerations; and management strategies for current and backlog sites. Each complex includes several plant species and may be found over a wide range of ecosystems. As a result, responses to treatments will vary within complexes, and prescriptions should be developed on a site-specific basis.

1. Description

Species Composition

Relatively pure stands of fireweed *(Epilobium angustifolium)* occur on recently harvested and burned openings. On backlog sites, fireweed usually occurs with minor components of species such as thimbleberry (*Rubus parviflorus*), red raspberry (*Rubus idaeus*), grasses, Sitka alder (*Alnus viridis*), and willow (*Salix* spp.).

Occurrence

The fireweed complex is common throughout British Columbia, except in the driest valley bottoms of the southern Interior. It is abundant and best developed in moist, cool biogeoclimatic zones (CWH, ICH, wetter ESSF, SBS, and BWBS) and generally is more abundant in the north.

The complex occurs on a variety of soil and site conditions, but is most vigorous on moist, open sites with medium- to coarse-textured soils. It establishes both on mineral soil and duff.

2. Development

Reproduction

Wind dispersal of fireweed seeds occurs in late summer and fall. Seeds can remain viable for up to two years. Once the fireweed is established, it forms extensive colonies through a spreading system of fleshy roots or "pseudorhizomes." Fireweed seedlings do not become established on dry sites or where vegetation is already well established.

Following disturbance, fireweed seedlings can develop from rhizomes of existing fireweed plants. Once established, fireweed forms extensive colonies of fleshy roots or "pseudorhizomes." Fireweed can also grow from buried seed or seed blown onto a site. Seed can remain viable for up to two years and is dispersed by the wind in summer and fall. However, establishment and development of fireweed seedlings requires disturbed sites, and will not establish on dry sites or sites that are fully occupied with other vegetation.

Rate of Development

Fireweed rapidly colonizes sites following disturbance. Plants can reach full height and produce seed in the same growing season as germination, but full development usually takes two years.

Plants develop an extensive root system the first year, and secondary shoots develop from buds along the roots. Fireweed clumps may expand by one metre per year.

Fireweed reaches its maximum abundance by the third growing season in coastal sites and by the fifth year on cedar-hemlock sites. The complex can typically persist for 10–30 years. However, a shrub or tree canopy can shade out the fireweed within 2–3 years.

The height and stem density of the fireweed — and consequently the need for vegetation control — depend largely on the moisture and nutrient status of the site. Rich, moist sites in CWH, ICH, SBS, and lower ESSF can produce plants up to 3 m high. These plants outcompete young conifer seedlings for light, moisture, and nutrients. Mechanical damage also occurs in the fall and winter when the dead fireweed stems crush seedlings.

Treatments that Affect Development

Fireweed rapidly occupies disturbed open space and effectively captures light, moisture, and nutrients that are released as a result of logging or site preparation. Because fireweed forms a relatively short-lived complex, appropriate silvicultural treatments can ensure that these resources are transferred to crop trees once they have become established.

On most sites, fireweed is not a problem unless planting is delayed, or improper species or stock types are selected. On problem sites, either minimizing colonization or reducing the cover and vigour of an established colony can reduce the fireweed complex.

Treatments that favour fireweed establishment include:

- clearcutting
- mineral soil exposure prior to seed dispersal by summer logging or mechanical site preparation (MSP)
- burning — fireweed dominance (but not necessarily vigour) increases with burn intensity
- delayed site preparation on a moss- or huckleberry-dominated ecosystem where fireweed is well established after logging.

Treatments or factors that discourage or delay fireweed establishment include:

- dry site or soil conditions (e.g., on mounds)
- site already occupied by other plant species (e.g., no site preparation, seeding domestic grasses and legumes)
- a duff layer (e.g., winter logging, no site preparation) or mat of dead vegetation (e.g., after herbicide treatment)
- prompt site preparation on moss- or huckleberry-dominated ecosystems.

Interactions with Crop Trees

Fireweed can be an important competitor during stand establishment, especially where fireweed is tall and dense. On the south coast, other brush species can outgrow fireweed within 1–3 years. In the Interior, fireweed is more threatening to seedlings because it is widespread, outgrows seedlings, and can dominate a site for several decades.

Since fireweed reaches full leaf cover in mid-June and conifer seedlings flush by mid- to late May, the competition-free window for seedlings is only two weeks. Extending this window would improve the survival and growth of seedlings. Fireweed overtops and substantially reduces the amount of light, moisture, and nutrients available to conifer seedlings. Also, the long, spindly conifers that develop under the fireweed are very susceptible to snowpress.

The competition thresholds that crop trees can sustain have been tentatively described as follows:

- diameter growth reduction becomes significant at about 30% cover (28 stems per square metre)

- some mortality begins in the first two years of crop establishment at densities over 50% cover (44 stems per square metre)
- competition levels are probably acceptable for shade-tolerant species if fireweed cover is <50%.

As a benefit, fireweed cover may delay the development of shrubby vegetation on cleared or burned areas, which may allow conifer seedlings to gain dominance on site. Fireweed also reduces soil erosion, increases the organic matter of severely disturbed sites, and stores nutrients.

3. Non-timber Values

Fireweed can be an important browse species for all deer species in B.C. It has a moderate to low importance as summer and fall food for moose and moderate importance for Roosevelt elk. In addition, fireweed colonies provide habitat and a food source for many small mammals. Although cattle have shown low grazing preference for fireweed, it is highly palatable to sheep.

Fireweed also contributes to the ecosystem in the following ways:

- the fireweed root system reduces soil erosion and nutrient leaching (e.g., reclamation of severely disturbed sites)
- fireweed's flowering phenology may indicate when conifer cone crops are ready for picking
- bees, hummingbirds, butterflies, and other insects use fireweed nectar
- bears eat fireweed, especially in spring
- the poor flammability of fireweed makes it a potential fuel break in fire-prone areas
- it quickly improves the aesthetic value of logged over or burned areas.

4. Pre-harvest Considerations

Silvicultural System

In most biogeoclimatic zones, clearcutting encourages fireweed competition by increasing light levels and soil temperatures. Conversely, partial cutting may reduce the abundance of fireweed.

Summer logging and ground-skidding systems, which increase the amount of disturbance to soil and understory vegetation, will increase fireweed development compared to winter logging and cable-yarding systems.

Advance Regeneration

Protecting advance regeneration during logging will minimize site disturbance and may provide shade to reduce fireweed invasion. Healthy advance regeneration of reasonable size may not suffer significantly from fireweed competition.

Method of Reforestation

If advance regeneration is neither suitable nor acceptable, planting large caliper stock, which resists the physical damage of vegetation press, is recommended.

Timing

If a fireweed problem is anticipated, immediate planting without site preparation is recommended. MSP, followed immediately with planting may also be suitable. These treatments force fireweed to establish from seed after site preparation, giving the seedlings 1–2 years headstart before fireweed dominates. Minimizing site preparation and regeneration delay will increase the competition-free window.

5. Vegetation Management Strategies for Current Sites

Site Preparation

General

On the fireweed complex, the best option is often not to prepare the site since the competition from the established vegetation makes fireweed invasion difficult. However, by not preparing the site, the existing vegetation may also compete with the young seedlings. The treatment decision should consider the forest management goals for the site.

Any system involving MSP or prescribed fire will aggravate fireweed establishment, and could therefore require follow-up treatments.

Mechanical

Mechanical site preparation alone is rarely considered an effective technique for controlling fireweed. High-impact MSP treatments, such as V-plowing, can control established communities of fireweed by removing the root system. However, these high-impact techniques are often detrimental to site productivity and are not recommended.

Of the lower impact mechanical treatments, patch scarifiers can create suitable planting spots by removing the root system. Control lasts 1–2 years, but planting in the scalp can create frost or flooding problems. Disc trenching is less successful because the fireweed root system is merely chopped up and re-invasion is rapid (1–2 years).

For longer-term control, mounding can increase the light available to seedlings. Mineral mounds create a drier, less favourable seedbed for fireweed and provide seedlings with a competitive advantage for 2–3 years. This treatment can be relatively expensive.

Following harvesting, when fireweed is not well established, MSP should be done promptly and prior to fireweed seedfall to minimize the need for follow-up brushing. Late fall MSP — after seed dispersal — is preferable if planting is to be carried out the following spring.

Screefing
Manual screefing is seldom effective as the fireweed root system is removed from only a small area. Larger, deeper screefs are preferable to reduce both competition and snowpress damage. Power screefing can be used to create a 1-m diameter patch and provide effective control for one season. However, the spot will soon be re-occupied by fireweed. As with a Bräcke treatment, screef depressions are prone to frost and flooding damage.

Prescribed Fire
Low- to medium-impact burns promote fireweed invasion of recently harvested sites more than no treatment. Reduced competition from other species and exposed mineral soil following burning encourage fireweed seed-in. Late summer broadcast burning is preferred because it does not promote fireweed invasion as much as MSP. On sites where MSP has been extensive, the height of fireweed can be twice that of burned sites.

Fireweed generally reaches its maximum cover within a couple of years of burning. The length of fireweed dominance after fire depends on the rate of development of other plant species and on nutrient availability. Fireweed is abundant but slower growing after very high impact burns and does not withstand repeated burning.

Chemical
Chemical site preparation is most suitable on sites where prompt planting and/or early prescribed fire or MSP are no longer possible. Chemical site preparation usually provides 1–2 years of vegetation control and can be used over a wider window during the application season than conifer release treatments as there is no crop requiring protection from damage.

Glyphosate is more effective than hexazinone and 2,4-D ester in controlling fireweed. Fireweed cover is usually significantly reduced, with fireweed dwarfed and deformed for up to two years following glyphosate treatment. Glyphosate, unlike hexazinone, does not bind in the soil organic matter. Efficacy of 2,4-D on fireweed is moderate (25–60%).

Seeding
Seed mixes with fall rye suppress the invasion of fireweed in the first growing season. However, they may also slow seedling growth ... ough root competition and mechanical damage. To increase the effectiveness of this treatment, seeding should occur immediately after scarification or burning, and tree seedlings should be planted in the same year to minimize the effects of grass competition.

Livestock Grazing
Fireweed is highly palatable to sheep, but at least two passes in a given year or one pass per year for two or more consecutive years are required to be effective. Repeated browsing appears to reduce fireweed competition for up to four years.

Planting

Timing

Planting large, vigorous stock immediately after logging or site preparation will minimize reforestation problems in this complex. Consider using summer stock and a site preparation schedule designed to give the seedlings the fall season to expand their root systems and increase caliper before fireweed becomes established.

Stock Type

Use PSB 415s or equivalent stock sizes with good caliper and vigour for Douglas-fir and spruce to minimize vegetation press problems.

Species Selection

A crop species with a rapid early rate of growth, such as lodgepole pine or larch, is appropriate on sites with moderate fireweed competition. On sites where severe competition is expected, large spruce or subalpine fir can tolerate and eventually grow through the competition.

Brushing

Manual

Manual cutting of fireweed provides crop-tree seedlings with short-term relief from light competition, and may actually increase fireweed density by stimulating sprouting from stem bases and suckering. As a single manual release from fireweed is ineffective for reducing competition, multiple entries are almost always required but may not be cost effective.

A single cutting or bending treatment conducted in early to mid-summer has been successful in some cases. This treatment must be repeated in two or more consecutive growing seasons until the seedling is sturdy enough to outgrow the fireweed. However, unacceptable seedling damage and rapid fireweed regrowth have also been observed with this treatment. In such cases, two cutting treatments in a single season — one in the early growing season while seedlings are still visible and the other in the late summer to fall — should be carried out. Repeat cuttings will eventually deplete fireweed root reserves. Treatments should be implemented the same year (late summer to fall) or one year after planting.

Where vegetation press (and not light competition) is the main problem, a bending or cutting treatment in late summer to fall can reduce damage.

If multiple cuttings are anticipated, staking the seedlings to make them easier to locate may be a cost-effective option.

Chemical

Glyphosate and hexazinone provide 1–3 years of control by reducing rhizomes. However, hexazinone is less effective as it tends to bind with the organic layer of the soil. The risk of damage to the conifer crop is the least with glyphosate and greatest with hexazinone. Glyphosate treatments should be carried out after bud set.

Livestock Grazing

At least two treatments in a given year or one treatment per year for two or more consecutive years are required to effectively deplete fireweed root reserves. Experience indicates a minimum of three repeated grazing treatments on a mesic site in the ICH (ICHmk3) will greatly reduce fireweed competition. On more productive sites, additional treatment entries may be required. Repeat treatments may be needed to control the new shoots produced each year from the extensive root/rhizome system and to deplete the root reserves.

6. Vegetation Management Strategies for Backlog Sites

General

Fill planting combined with the appropriate follow-up treatments is a suitable strategy on backlog sites. Also refer to Section 5, *Vegetation Management Strategies for Current Sites*.

Mechanical

Of the MSP treatments available, only a mounding treatment can effectively control fireweed on backlog sites.

Prescribed Fire

This treatment alone is not recommended as it exacerbates fireweed competition.

Chemical

Only late summer application of glyphosate can effectively control fireweed.

"Brown-and-Burn"

"Brown-and-burn" treatments result in rapid recovery of fireweed within two years.

7. Summary of Treatment Efficacy

Among the non-chemical treatments, using advance regeneration, sheep browsing, mounding, planting large stock immediately after site preparation, and selecting fast-growing crop species are leading choices for reducing vegetative competition in the fireweed complex.

Among the chemical treatments, glyphosate and hexazinone can provide 1–3 years of control from fireweed competition. Glyphosate in particular has a broad efficacy spectrum for both fireweed and its associated species. As well, most conifers tolerate glyphosate applied in the early fall. Hexazinone, though it has acceptable efficacy, causes greater damage to crop trees (particularly pine) when used for conifer release. Surface organic material can make hexazinone ineffective.

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Appendix - Key to Biogeoclimatic Zones of British Columbia

AT	Alpine Tundra	IDF	Interior Douglas-fir
BG	Bunchgrass	MH	Mountain Hemlock
BWBS	Boreal White and Black Spruce	MS	Montane Spruce
CDF	Coastal Douglas-fir	PP	Ponderosa Pine
CWH	Coastal Western Hemlock	SBPS	Sub-Boreal Pine–Spruce
ESSF	Engelmann Spruce–Subalpine Fir	SBS	Sub-Boreal Spruce
ICH	Interior Cedar–Hemlock	SWB	Spruce–Willow–Birch